PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-225570

(43)Date of publication of application : 03.09.1993

Int.Cl. G11B 7/00
G11B 7/125

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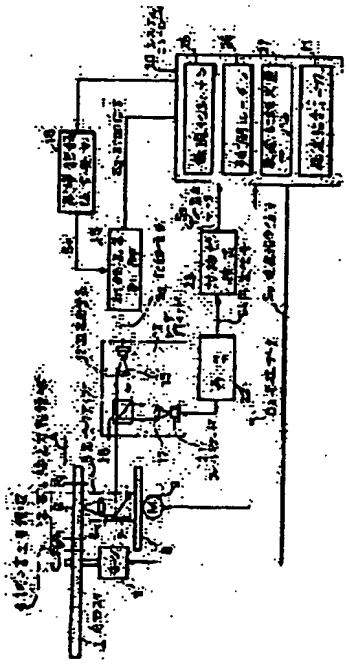
DEVICE AND METHOD FOR RECORDING OPTICAL DISK

Abstract:



RPOSE: To find an optimum recording light quantity esponding to all recordable area of individual optical in a relatively short time.

NSTITUTION: When information is recorded in a trial ng area 4 formed on an inner peripheral side than ewritable area 2 of the optical disk 1, the optimum rding light quantity is found by rotating the optical 1 at a linear velocity the same as the linear velocity least two positions (radius R1 and radius R2) of a al direction A in the rewritable area 2. Then, by orming interporation processing or extraporation essing to the optimum recording light quantity in two r velocities found by such a manner by an polation routine 26, the optimum recording light ıtity at all linear velocities in the rewritable area 2 is found. Thus, the optimum recording quantity is found for all areas in the rewritable area 2 of individual optical disk 1 at a ive short time.

AL STATUS

e of request for examination] 14.01.1999

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: of final disposal for application]	
nt number]	3039099
: of registration]	03.03.2000
ber of appeal against examiner's ion of rejection]	
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IMS

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n(s)]

n 1] The field for trial writing is formed in an inner circumference side rather than the recordable for users of an optical disk. In case information is made to record on this field for trial writing, the :-mentioned optical disk is rotated with the 1st and 2nd linear velocity equal to the linear velocity east two locations radial [in / above-mentioned / for users / recordable / a field]. The record ity of light control means which makes information record on the above-mentioned optical disk he 1st and 2nd record quantity of lights, respectively, A playback means to reproduce the nation recorded on the above-mentioned optical disk, and to output the 1st and 2nd regenerative s corresponding to the above 1st and the 2nd record quantity of light, A comparison means to ire the optimal regenerative signal beforehand determined as the 1st and 2nd regenerative signals above, According to the comparison result of the above-mentioned comparison means, it has an ization means to optimize the 1st and 2nd record quantity of lights supplied to the above-)ned record quantity of light control means, and an operation means. The above-mentioned ion means The optical disk recording device characterized by calculating the record quantity of vhich becomes the optimal in all the linear velocity in the above-mentioned recordable field for)y interpolation processing or extrapolation processing based on the 1st and 2nd record quantity of optimized by the above-mentioned optimization means.

1 2] The field for trial writing is formed in an inner circumference side rather than the recordable)r users of an optical disk. The 1st process in which rotate the above-mentioned optical disk with velocity equal to the linear velocity in at least two locations radial [in the above-mentioned able field for users], and the optimal record conditions are searched for in case information is o record on this field for trial writing, The optical disk record approach characterized by having l process in which the optimal record conditions in all the linear velocity in the above-mentioned ible field for users are searched for by performing interpolation processing or extrapolation sing to the optimal record conditions of two linear velocity which was carried out in this way, and ch it asked.

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ILED DESCRIPTION

ed Description of the Invention]

rial Application] this invention – for example, repeat record – it applies to the optical disk of a able reversible mold, and is related with a suitable optical disk recording device and its approach.

ption of the Prior Art] repeat record – in case a record pit (or mark) is formed to a refreshable disk, or in case a record pit (or mark) is formed to the optical disk of a postscript mold, it is ıry to hold to a suitable value, the quantity of light, i.e., the record quantity of light, of the laser radiated by those optical disks By making the configuration of the formed record pit into high uniformly, it is for lessening a playback error and raising recording density.
In order to set the record quantity of light as a suitable value, it tries and writes conventionally on k which has the suitable radius in [for users / recordable] a field beforehand defined in the disk, a field is formed, and he is trying to check the suitable record quantity of light with this one elocity corresponding to [try and write and] a radius in a field.

m(s) to be Solved by the Invention] By the way, in case it records with the suitable record ' of light which carried out in this way and was checked, in record in the field near the above- ıed trial writing field, it becomes possible for a playback error to decrease in comparison and to :ording density.
However, with the suitable record quantity of light checked with one linear velocity for which it s mentioned above, when a video signal was recorded and the record range included the large m the most inner circumference of the record section for users of the above-mentioned optical he outermost periphery, since linear velocity did not serve as the record quantity of light suitable : in other fairly different locations, the limitation was in densification.
This invention is made in view of such a technical problem, and it aims at offering the optical ording device which can ask for the optimal record conditions in the record section for users of lical disk in a short time comparatively, and its approach.

for Solving the Problem] this invention optical disk recording apparatus forms the field 4 for ting in an inner circumference side rather than the recordable field 2 for users of an optical disk)wn in drawing 1 . At least two locations R1 radial [in the recordable field 2 for users] and R2 nformation is made to record on this field 4 for trial writing An optical disk 1 is rotated with the 2nd linear velocity equal to the linear velocity which can be set. The record quantity of light neans 15 which makes information record on the above-mentioned optical disk with the 1st and rd quantity of lights, respectively, A playback means 22 to reproduce the information recorded)tical disk 1, and to output the 1st and 2nd regenerative signals corresponding to the above 1st 2nd record quantity of light, A comparison means 23 to compare the optimal regenerative signal nd determined as the 1st and 2nd regenerative signals of the above, An optimization means 25

nize the 1st and 2nd record quantity of lights supplied to the record quantity of light control 15 according to the comparison result of the comparison means 23, Having the operation means operation means 26 calculates the record quantity of light which becomes the optimal in all the elocity in the recordable field 2 for users by interpolation processing or extrapolation processing n the 1st and 2nd record quantity of lights optimized by the optimization means 25.
this invention optical disk record approach forms the field 4 for trial writing in an inner erence side rather than the recordable field 2 for users of an optical disk 1, as shown in drawing ast two locations R1 radial [in the recordable field 2 for users / A] and R2 in case information to record on this field 4 for trial writing The 1st process in which rotate an optical disk 1 with elocity equal to the linear velocity which can be set, and the optimal record conditions are d for, By performing interpolation processing or extrapolation processing to the optimal record ns in two linear velocity which was carried out in this way and for which it asked, it has the 2nd in which the optimal record conditions in all the linear velocity in the recordable field 2 for users tical disk 1 are searched for.

n] In case information is made to record on the field 4 for trial writing formed in the inner erence side rather than the recordable field 2 for users of an optical disk 1 according to this n optical disk recording apparatus, by the record quantity of light control means 15 At least two s R1 radial [in the recordable field 2 for users / A], and R2 An optical disk 1 is rotated with the 2nd linear velocity equal to the linear velocity which can be set. Information is made to record ptical disk 1 with the 1st and 2nd record quantity of lights, respectively. With the playback 2, the comparison means 23, and the optimization means 25 The 1st in the 1st and 2nd linear of the above in the field 4 for trial writing optimized and the 2nd record quantity of light are ed. He is trying to calculate the optimal record quantity of light in all locations radial [in the ble field 2 for users / A] based on the 1st and 2nd record quantity of lights by which ation was carried out [above-mentioned] with the operation means 26. For this reason, the record quantity of light can be comparatively calculated in a short time from all the fields in the ection 2 for users of each optical disk 1.
When making information record on the field 4 for trial writing formed in the inner erence side rather than the recordable field 2 for users of an optical disk 1 in the 1st process g to this invention optical disk record approach, At least two locations R1 radial [in the le field 2 for users / A], and R2 An optical disk 1 is rotated with linear velocity equal to the locity which can be set, and the optimal record conditions are searched for. In the 2nd process ations R1 which were carried out in this way and for which it asked, and R2 He is trying to r the optimal record conditions in all the linear velocity in the recordable field 2 for users by ng interpolation processing or extrapolation processing to the optimal record conditions in locity equal to the linear velocity which can be set. For this reason, all in the record section 2 of each optical disk 1 can carry out a field pair, and it can ask for the optimal record conditions t time comparatively.

e] Hereafter, one example of the optical disk recording device with which this invention optical rd approach was applied is explained with reference to a drawing.
rawing 1 shows the rough configuration of the optical disk record regenerative apparatus with e optical disk recording apparatus by this example was applied. Drawing 2 shows the flat-onfiguration of the optical disk.
drawing 1 and drawing 2 , 1 is an optical disk and this optical disk 1 has the rewritable field 2 a recordable field for users. this rewritable field 2 – radius R1 from – radius R2 up to – it is a field. Moreover, the field 4 for trial writing is formed in the inner circumference side of this e field 2. this – trying – writing – business – a field 4 – radius R0 from – radius R1 up to – it on a ring. In addition, the optical disk which can be written in only not only an optical disk e as an optical disk 1 but once is sufficient.

| The optical pickup 5 for countering the disk side of this optical disk 1, and performing writing or g of a record pit is arranged. An optical pickup 5 has an objective lens 6 and a mirror 7, and it is uted so that it may be moved to radial [of an optical disk 1 / A] by the delivery device which ts of motor 9 grades for delivery in a guard rail 8 top.

| It is specified by the encoder connected to the revolving shaft of a spindle motor 8, and the n R on radial [of an optical pickup 5 / A], i.e., a radius, is the radius data DR. It carries out and a controller 10 is supplied. A system controller 10 is the radius data DR from the above-mentioned r. The above-mentioned delivery device can be controlled on a radical, and an optical pickup 1 moved to the point of the predetermined radius R specified by the radius tab-control-specification hich system controller 10 the very thing generates.

| This optical disk 1 is the rate command signal SV from a system controller 10. It is based and with a fixed angular velocity (CAV) with a spindle motor 3. Therefore, since the linear velocity a predetermined radius R location is determined by the product of a radius R and angular velocity, be proportional to a radius R. This rate command signal SV The contents of the rate command 1 which corresponds and is stored in the system controller 10 are shown in drawing 3 .

| As shown in drawing 1 , the fixed optical system 12 is optically connected to the optical pickup 5 to radial [A]. The fixed optical system 12 has the laser diode 13 controlled by the light ation method. The record quantity of light control circuit 15 as a record quantity of light control is connected to the laser diode 13. This record quantity of light control circuit 15 supplies the signal S2 (refer to drawing 2 B) which is a modulation current signal to a laser diode 13. This signal S2 The amplitude is the control signal S3 supplied from a system controller 10. It is ined and is the record signal S2. The on-off section is determined by the binary criteria record S1 (refer to drawing 4 A) supplied from the criteria record signal generating circuit 16.

A laser diode 13 carries out outgoing radiation of the laser beam which has the quantity of light tional to the record signal S2 supplied from the record quantity of light control circuit 15. After er beam by which outgoing radiation was carried out from the laser diode 13 is made parallel light collimator lens 15, the sense is changed 90 degrees by the mirror 7 through a beam splitter 16. n objective lens 6, it is condensed again and the parallel light reflected by the mirror 7 is ted by the optical disk 1 as a laser beam. Thus, it collaborates with the magnetic circuit which is strated and a record pit (magnetization pit) is formed to an optical disk 1.

On the other hand, it reads, and it is reflected by the optical disk 1 which was irradiated by the disk 1 and with which the record pit was formed, and incidence of the laser beam of business is out to a photodiode 21 through an objective lens 6, a mirror 7, a beam splitter 16, and a ser lens 17.

The output signal of a photodiode 21 is supplied to a regenerative circuit 22. A regenerative 22 is supplied to the symmetric-property detector 23 as a comparison means by making ation currently recorded on the optical disk 1 based on the output signal of the supplied iode 21 into regenerative-signal S4 (referring to drawing 4 (S41-S43) C - drawing 4 E).

The symmetry detector 23 is regenerative-signal S4. Duty ratio data S5 which responded A controller 10 is supplied.

A system controller 10 is the supplied duty ratio data S5. It analyzes by the optimization routine n optimization means to mention a detail later, and is the predetermined control signal S3. The quantity of light control circuit 15 is supplied. It is a control signal S3 by repeating this zation routine 25. Optimization is attained.

In this case, control signal S3 Optimization, i.e., optimization of the luminescence quantity of from a laser diode 13, is performed in the field 4 for trial writing of an optical disk 1. namely, – ying – writing – business -- the radius R1 which is the most inner circumference of the ble field 2 in a field 4 The linear velocity LV 1 which can set And the radius R2 which is the ost periphery Linear velocity LV 2 which can be set ******** -- control signal S3 Optimization rmed and optimization in all the radius locations in [rewritable] a field 2 is performed by the lation routine 26 by interpolation processing by linear interpolation or the function interpolation

d beforehand.
| In addition, what is necessary is just to choose it as the function showing the average property of
)perty (henceforth an optimal record quantity of light property if needed) of the radius pair
ım control signal S3 (it corresponds to the optimal record quantity of light) of having asked for the
l disk 1 of two or more sheets beforehand as a function defined beforehand from all points radial
ı rotating by the constant angular velocity (CAV) / A], for example. Moreover, as a function of
)lation, it is good also as a function proportional to the 1-/square of linear velocity LV.
Moreover, when the optimal record quantity of light is determined with two linear velocity
)onding to two suitable radius locations, not only interpolation processing but the rewritable
of a field 2, the rewritable field between the radii corresponding to these two linear velocity can
· rewritable fields other than between [corresponding to these two linear velocity by interpolation
sing] radii by extrapolation processing.
In the case of linear interpolation, it is the most-inner-circumference radius R1 of the rewritable
. Receiving linear velocity LV 1 Outermost periphery radius R2 Receiving linear velocity LV 2
:s the obtained optimal record quantity of light Radius R1 Radius R2 Middle radius R3 Linear
y LV 3 to {R3 =R1+ (R2-R1)/2} The optimal record quantity of light is determined and it is this
inear velocity [LV / LV, LV /2 /, and / 3] 1. Linear interpolation of the between may be carried
d the optimal record quantity of light may be determined. Thus, by performing linear interpolation
ıree linear velocity, a much more accurate interpolation value can be acquired as compared with
ear interpolation of two linear velocity.
thus, linear velocity LV pair optimum control signal S3 searched for by the interpolation routine
operty – in other words, an optimal record quantity of light property is memorized by the optimal
quantity of light table 27 as a storage means.
Therefore, it becomes possible by referring to this optimal record quantity of light table 27 to
on an optical disk 1 with the optimal record quantity of light in all the fields of the rewritable

Next, actuation of the above-mentioned example is especially explained in detail below about the
zation routine 25, referring to the flow chart shown in drawing 5 .
First, an optical pickup 5 is moved in the direction of a core radial [A] by the motor 9 for
y, and the system controller 10 which detected that the optical disk 1 had been arranged at the
f a spindle motor 3 is the location R0 of the field 4 for trial writing, for example, a radius.
;ement immobilization is carried out in a location (step S101). In addition, radius data DR =R0 It
eck with the output data of the encoder of the motor 9 for delivery.
Next, a system controller 10 refers to the rate command table 27 (refer to drawing 3), and is the
R0. It is a radius R1 to a spindle motor 3 in a location. Linear velocity LV 1 which can be set
)mmand signal SV which is rotated It supplies (step S102). Radius R0 It is a radius R1 in a
n. Linear velocity LV 1 which can be set In order to make it rotate with equal linear velocity,
he linear velocity is set to LV01, it is LV01=(R1 / R0) LV0 =LV1. Rate command signal SV
becomes What is necessary is just to supply.
Subsequently, a system controller 10 is a control signal S3. A value is set as a suitable value and
)rd quantity of light control circuit 15 is supplied. In this case, criteria record signal S1 shown in
g 2 A from the criteria record signal generating circuit 16 By supplying the record quantity of
)ntrol circuit 15, as shown in drawing 2 B, the amplitude is a control signal S3. Record signal S2
ined with the value A laser diode 13 is supplied. This record signal S2 A record pit is formed in
:al disk 1 of the laser beam from the laser diode 13 which responded. Next, the laser beam for
ıt is irradiated by the optical disk 1, the reflected light corresponding to the record pit formed as
ned above is read by the photodiode 21, and it is regenerative-signal S4 by the regenerative
22. It is formed (step S103). Regenerative-signal S4 at this time It shall be the wave-like
ative signal S41 as shown in drawing 2 C.
This regenerative signal S41 is supplied to the symmetric-property detector 23. The symmetry
r 23 is the maximum level VMAX of a regenerative signal S41. One half of reference level VR

ty ratio data S5 (S5 =B/A) which can be set are created. A system controller 10 reads this duty
.ta S5 (S5.=B/A) (step S104), and judges whether the read duty ratio data S5 (S5 =B/A) are 50%
105).
When it is not 50% in the judgment of step S105, it is judged whether next it is 50% or more
106).
In this case, regenerative-signal S4 Since it is the regenerative signal S41 shown in drawing 2 C,
s than 50%, and it is the record signal S2. It turns out that the record quantity of light of the based
ode 13 is excessive. Then, control signal S3 Specified quantity reduction is carried out and it is
trol signal S3 which carried out specified quantity reduction to the record quantity of light
circuit 15. It is the record signal S2 by supplying. Specified quantity reduction is carried out
107).
Regenerative-signal S4 outputted from a regenerative circuit 22 When it is the regenerative
342 as shown in drawing 2 E, the duty ratio data S5 (S5 =B/A) read from the symmetry detector
me less than 50%. In this case, control signal S3 The increment in the specified quantity is
out and it is that control signal S3 that carried out the increment in the specified quantity to the
quantity of light control circuit 15. It is the record signal S2 by supplying. The increment in the
d quantity is carried out (step S108).
Thus, regenerative-signal S4 outputted from a regenerative circuit 22 when the duty ratio data S5
/A) become 50% by repeating step S103 - step S108 Reference level VR as shown in drawing 2
nerative-signal S4 It becomes the regenerative signal S42 which becomes point symmetry mostly
asis of Intersection F. In addition, the duty ratio data S5 (S5 =B/A) are 50% of regenerative-
34. When recording information is reproduced, lack of playback data stops being able to happen
sily. In this case, generating of a playback error decreases and dependability improves.
By thus, the thing for which the judgment of step S105 is materialized Radius R0 in the field 4
writing It sets in a location and is a radius R1. Linear velocity LV 1 Corresponding linear
/ LV01=(R1 / R0) LV0 =LV1 Optimum control signal S3 Since a value can be determined It is
ized for the storage means which is not illustrated in a system controller 10 (step S109).
Similarly, it is a radius R0. It sets in a location and is a radius R2. Linear velocity LV 2
onding linear velocity LV02=(R2 / R0) LV0 =LV2 Optimum control signal S3 Since a value can
rmined, it memorizes for a storage means by which it is not illustrated in a system controller 10,

Next, a system controller 10 is the optimum control signal [in / by the interpolation routine 26 /
inear velocity LV of the rewritable fields 2] S3. A value is calculated by interpolation
ing.
Drawing 6 shows the optimum control signal S3 30 searched for by this interpolation processing,
optimal record quantity of light property. Namely, linear velocity LV 1 Optimum control signal
ched for with the corresponding linear velocity LV 01 The corresponding optimal record quantity
P1 Linear velocity LV 2 Optimum control signal S3 searched for with the corresponding linear
/ LV 02 The corresponding optimal record quantity of light P2 The property that function
lation of the between was carried out is shown.
Thus, in order to determine the optimal record quantity of light in the rewritable field 2 according
bove-mentioned example When making information record on the field 4 for trial writing formed
ner circumference side rather than the rewritable field 2 of an optical disk 1, At least two radii
in the rewritable field 2 of an optical disk 1], For example, a radius R1 and R2 Linear velocity
V and / 2] 1 in a location An optical disk 1 is rotated with the corresponding linear velocity
nd LV02, and it is the optimal record quantity of light P1 and P2. It asks. He is trying to
e the optimal record quantity of light [in / by the interpolation routine 26 / all the locations of
ritable field 2 of an optical disk 1] by interpolation processing or extrapolation processing. For
son, the optimal record quantity of light can be comparatively calculated in a short time from all
ar velocity LV in the rewritable field 2 of each optical disk 1.
In addition, as for this invention, it is needless to say that various configurations can be taken,

t deviating from the summary of not only the above-mentioned example but this invention.

of the Invention] In case information is made to record on the field for trial writing formed in the ircumference side rather than the recordable field for users of an optical disk as explained above ing to this invention optical disk recording apparatus, by the record quantity of light control The above-mentioned optical disk is rotated with the 1st and 2nd linear velocity equal to the velocity in at least two locations radial [in the above-mentioned recordable field for users]. ation is made to record on the above-mentioned optical disk with the 1st and 2nd record quantity s, respectively. With a playback means, a comparison means, and an optimization means The 1st st and 2nd linear velocity of the above in the field for trial writing of the above-mentioned disk optimized and the 2nd record quantity of light are calculated. He is trying to calculate the l record quantity of light in all points radial [in the above-mentioned recordable field] based on and 2nd record quantity of lights by which optimization was carried out [above-mentioned] with ration means. For this reason, the effectiveness that the optimal record quantity of light can be atively calculated in a short time from all the fields of the record section for users of each optical acquired.

Moreover, when making information record on the field for trial writing formed in the inner ference side rather than the recordable field for users of an optical disk in the 1st process ng to this invention optical disk record approach, Rotate the above-mentioned optical disk with velocity equal to the linear velocity in at least two locations radial [in the above-mentioned ble field for users], and the optimal record conditions are searched for. He is trying to search for mal record conditions in all the linear velocity in the above-mentioned recordable field by ning interpolation processing or extrapolation processing to the optimal record conditions of two ns which were carried out in this way and for which it asked in the 2nd process. For this reason, ctiveness that the optimal record conditions can be comparatively searched for in a short time l the fields in the record section for users of each optical disk is acquired.

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awings, any words are not translated.

TION OF DRAWINGS

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cription of the Drawings]
1] It is the diagram showing the configuration of the optical disk record regenerative apparatus
h one example of the optical disk recording apparatus by this invention was applied.
2] It is the diagram showing the flat-surface configuration of an optical disk among the optical
d regenerative apparatus shown in drawing 1 .
3] It is the diagram showing the contents of the rate command table stored in a system
among the optical disk record regenerative apparatus shown in drawing 1 .
4] It is the wave form chart with which explanation of the optical disk record regenerative
shown in drawing 1 of operation is presented.
5] It is the flow chart with which explanation of the optical disk record regenerative apparatus
drawing 1 of operation is presented.
6] It is the diagram showing the optimal record quantity of light property searched for with the
k record regenerative apparatus shown in drawing 1 .
on of Notations]
Disk
ole Field
Trial Writing
Quantity of Light Control Means
rative Circuit
tric-Property Detector
zation Routine
lation Routine
l Record Quantity of Light Table

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